



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

October 19, 2018

The Honorable Kristine L. Svinicki  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:** DRAFT PROPOSED RULE, "EMERGENCY PREPAREDNESS FOR  
SMALL MODULAR REACTORS AND OTHER NEW TECHNOLOGIES"

Dear Chairman Svinicki:

During the 657<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, October 4-5, 2018, we reviewed the draft proposed rule, "Emergency Preparedness for Small Modular Reactors and Other New Technologies," and the associated draft regulatory guide, DG-1350. Our Future Plant Designs and Regulatory Policies and Practices Subcommittees also reviewed this matter during a meeting on August 22, 2018. During these meetings we had the benefit of discussions with representatives of the NRC staff and other stakeholders. We also had the benefit of the referenced documents.

**CONCLUSION AND RECOMMENDATION**

- 1 We find no technical obstacles at this time to the rulemaking and recommend that it move forward.
- 2 For the rule to be applied effectively, the staff will also need to provide guidance to define their expectations for the technical adequacy of mechanistic source terms.

**BACKGROUND**

In SECY-10-0034, the staff identified that emergency planning (EP) was a key technical issue for licensing small modular reactors (SMRs). The staff recognized that the one-size fits all approach being used for large light-water reactors (LWRs) would not be necessary, given the unique and varied designs that could be proposed for licensing, particularly that there would be much smaller reactors and expanded use of passive safety systems.

Following public meetings with industry and stakeholders, the staff issued SECY-11-0152. This paper discussed the staff's intent to develop a technology-neutral (now called technology-inclusive), dose-based, consequence-oriented EP framework for SMR sites that takes into account the various designs, modularity, and colocation, as well as the size of the emergency planning zone (EPZ).

In SECY-14-0038, the staff requested Commission approval to begin work on a systematic review and revision of EP requirements to employ a more performance-based oversight regimen (regulation, inspection, and enforcement). The Commission staff requirements memorandum agreed and noted the usefulness of such a performance-based approach for SMRs.

In SECY-15-0077, the staff proposed an approach for rulemaking to establish an EP framework for SMRs and other new technologies (ONTs) based on the projected offsite dose in the unlikely occurrence of a severe accident. The Commission approved the staff's plan and directed the staff to proceed with rulemaking in SRM-SECY-16-0069.

In August 2016, the staff held a public meeting to request feedback from interested stakeholders on a potential approach the NRC could follow in developing the rulemaking for EP for SMRs and ONTs. Participants favored the performance-based approach as one that would provide flexibility to account for a broad range of accident scenarios for various SMR and ONT designs.

Staff developed the regulatory basis document for the rulemaking and issued it for comment in April 2017. The staff resolved comments and issued the final regulatory basis in September 2017. The proposed rulemaking language and draft regulatory guidance was developed from the bases presented in the regulatory basis document.

## **DISCUSSION**

We reviewed the draft rule, its associated guidance, and references. The draft rule is straightforward. It replicates most of what is included in 10 CFR 50.47 and Appendix E. There are two significant changes: the organization of emergency plan requirements and new alternative EPZ guidance and requirements.

The requirements for the emergency plan have been rearranged in a more logical order to suggest priorities, include lessons learned in applying the existing rules, and modify requirements to be performance-based rather than prescriptive. Both the staff and representatives from potential applicants indicated that these changes will help applicants in preparing their emergency plans. We concur and note that the guidance for preparing emergency plans in DG-1350 is thorough and easy to follow.

The changes to the EPZ requirement are significant and the main purpose of the new rule. Existing regulations require that, generally, the plume exposure pathway EPZ for nuclear power reactors with an authorized power level greater than 250 MW thermal shall consist of an area about 10 miles in radius and the ingestion pathway EPZ shall consist of an area about 50 miles in radius. The new alternative EP requirements and guidance would adopt a variable plume exposure pathway EPZ approach and address ingestion response planning.

The proposed rule allows the applicant to propose a plume exposure pathway EPZ boundary that provides public protection from dose levels above a 10 mSv (1 rem) total effective dose equivalent threshold. The primary purpose of this EPZ is to provide an area where predetermined protective actions are implemented, which reduce dose and associated early health effects. In determining this boundary, the applicant would consider plume exposure doses from a spectrum of credible accidents for the facility. The rule would allow SMR and ONT applicants to develop reduced EPZ sizes, commensurate with the accident source terms, fission product releases, and accident dose characteristics specific to their reactor designs.

Application of the rule will require determination of release scenarios and source terms for possible accidents, but the guidance in DG-1350 is meager on this issue. Appendix A provides a flow chart outlining the analyses an applicant should perform to support radiological dose assessment for EPZ size evaluation. Its guidance for determining the source term is brief: "Identify release scenarios and evaluate source term information..." and refers to the text of the Appendix, which advises the applicant to consider a spectrum of accidents and the source term for each. Developing mechanistic source terms is not an easy task for this application and other regulatory activities. It involves complex physics and chemical phenomena including the evolution and transport of aerosols. The staff should provide guidance to evaluate the adequacy of the frequency of events considered and the duration over which such events must be analyzed.

While we see no reason to delay the rulemaking, it is important for the staff to provide guidance on how source terms should be developed. In SECY-16-0012, the staff stated that they have been in pre-application discussions with SMR designers, and the methods proposed by potential applicants appear to generally build on currently approved methods. Without additional guidance, the staff will need to review design and licensing information on a case-by-case basis to ensure that the information applicants provide on offsite dose consequences supports the requested EPZ size, and that the applicable requirements ensure adequate protection of public health and safety and the environment. This case-by-case approach is contrary to the goal of reduced regulatory uncertainty.

Finally, none of the arguments for the new rule and the treatment of the EPZ include any reference to the power of the facility. No technical basis is stated in the rule or the guidance for restricting use of the new rule to SMRs and ONTs with a limit on thermal power. The rule could apply to any reactor technology regardless of size. During our meetings, the staff acknowledged this point and agreed to request stakeholder input on this topic.

We look forward to following the rulemaking process and working with the staff as the rule moves forward.

Sincerely,

**/RA/**

Michael Corradini  
Chairman

## REFERENCES

- 1 U.S. Nuclear Regulatory Commission, Rulemaking NRC-2015-0225, "Emergency Preparedness for Small Modular Reactors and Other New Technologies," Draft, August 2018 (ML18213A278).
- 2 U.S. Nuclear Regulatory Commission, Draft Regulatory Guide DG-1350, "Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities," August 2018 (ML18213A284).
- 3 U.S. Nuclear Regulatory Commission, SECY-10-0034, "Potential Policy, Licensing, and Key Technical Issues for Small Modular Reactor Designs," March 28, 2010 (ML093290268).
- 4 U.S. Nuclear Regulatory Commission, SECY-11-0152, "Development of an Emergency Planning and Preparedness Framework for Small Module Reactors," October 28, 2011 (ML112570439).
- 5 U.S. Nuclear Regulatory Commission, SECY-14-0038, "Performance-Based Framework for Nuclear Power Plant Emergency Preparedness Oversight," April 4, 2014 (ML13238A018).
- 6 U.S. Nuclear Regulatory Commission, SECY-15-0077, "Options for Emergency Preparedness for Small Module Reactors and Other New Technologies," May 29, 2015 (ML15037A176).
- 7 U.S. Nuclear Regulatory Commission, SRM-SECY-16-0069, "Staff Requirements – SECY-16-0069 – Rulemaking Plan on Emergency Preparedness for Small Module Reactors and Other New Technologies," June 22, 2016 (ML16174A166).
- 8 U.S. Nuclear Regulatory Commission, Regulatory Basis, "Rulemaking for Emergency Preparedness for Small Modular Reactors and Other New Technologies," September 2017 (ML17206A265).
- 9 U.S. Nuclear Regulatory Commission, SECY-16-0012, "Accident Source Terms and Siting for Small Modular Reactors and Non-Light Water Reactors," February 7, 2016 (ML15037A176).

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